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APPLICATION FOR LETTERS PATENT

TITLE: INFORMATION PROCESSING APPARATUS
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INFORMATION PROCESSING APPARATUS

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to an information processing apparatus, and more particularly to a portable information processing apparatus which prevents damage to an image pickup section.

Description of the Related Art

An assignee of the present patent application proposed an apparatus wherein a video camera of a small size is mounted at an upper end portion of a display panel section of a portable personal computer on which a liquid crystal display unit is mounted, for example, in Japanese Patent Laid-Open No. 51665/1998. FIGS. 15 to 17 show the apparatus disclosed in the document.

Referring first to FIG. 15, a personal computer 161 includes a body section 162 in the form of a housing having a rectangular configuration of a small thickness, and a display panel section 165 formed from a housing of a size substantially equal to that of the body section 162 and mounted for pivotal opening and closing movement on the body section 162 for displaying graphics, characters and so forth thereon. When the personal

The camera body section 171 can be slidably moved around the center of the turning sphere 175 so that it can pick up an image over a predetermined range through the lens section 172 thereof.

Since the CCD video camera 169 includes the turning shaft 174 of a predetermined length in this manner, if a force is applied to the camera body section 171 to vary the direction of the camera body section 171, then a pivoting force is imparted through the turning shaft 174 to the turning sphere 175. In other words, the direction of the camera body section 171 can be varied around the center of the turning sphere 175 to suitably vary the image pickup range of the CCD video camera 169. When no pivoting force is applied, the turning sphere 175 is not turned in the support member 168 and fixedly supports the camera body section 171 thereby to maintain the image pickup direction of the camera body section 171.

A modified personal computer is shown in FIG. 17. Referring to FIG. 17, in the modified personal computer also denoted at 161, a hole 170 is formed in the front wall of the display panel section 165, and the CCD video camera 169 is mounted in the hole 170.

However, where the personal computer 161 is constructed in such a manner as shown in FIG. 15 wherein

the mounting groove 167 is formed in the display panel section 165 and the CCD video camera 169 is mounted in the mounting groove 167 using the support member 168, since the CCD video camera 169 can be turned to a position in which it projects from the display panel section 165, there is a possibility that the user may inadvertently bring the CCD video camera 169 into contact with some other obstacle, resulting in damage to the CCD video camera 169.

On the other hand, where the personal computer 161 is constructed in such a manner as shown in FIG. 17 wherein the CCD video camera 169 is fitted in the hole 170 formed in the front wall of the display section of the display panel section 165, the possibility that the CCD video camera 169 may collide with and be damaged by an external obstacle decreases. However, there is a possibility that, when the display panel section 165 is pivoted into a closed condition onto the body section 162, the CCD video camera 169 may collide with and be damaged by the body section 162. This possibility increases particularly where the CCD video camera 169 is constructed for manual focusing adjustment. Further, where the CCD video camera 169 is fitted in the hole 170 formed in the front wall of the display panel section 165,

the range within which the CCD video camera 169 can pick up an image is limited to the front of the portable personal computer 161. Consequently, the portable personal computer 161 has a subject to be solved in that the CCD video camera 169 cannot fetch an image from above or from the rear of the portable personal computer 161.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an information processing apparatus wherein a CCD video camera incorporated therein is prevented from being damaged and can fetch an image not only from the front but also from above and from the rear of the information processing apparatus.

In order to attain the object described above, according to the present invention, there is provided an information processing apparatus, comprising a body having a keyboard thereon, and a display section mounted for pivotal opening and closing movement with respect to the body and having, on a first face thereof which opposes the keyboard when the display section is pivotally closed on the body, a display face for displaying an image thereon, the display section including image pickup means for picking up an image,

accommodation means of a substantially tubular shape for accommodating the image pickup means therein, and supporting means for supporting the accommodation means at portions thereof in the proximity of the opposite ends of the tubular shape for turning motion in a vertical plane over an angular range of approximately 180 degrees outwardly between a first position at which the image pickup means is directed in the same direction as the first face of the display section and a second position at which the image pickup means is directed in the same direction as a second face of the display section which is opposite to the first face, the body including providing means for providing a space for allowing the accommodation means to be turned without contacting with the body when the display section is pivotally closed on the body.

With the information processing apparatus, since the accommodation means in which the image pickup means is accommodated is supported for turning motion in the vertical plane over the angular range of approximately 180 degrees outwardly between the first position and the second position by the supporting means and the providing means for providing the space for allowing the accommodation means to be turned is provided in the body,

therefore possible damage to the image pickup means can be prevented, and besides the image pickup means can fetch an image from the front, above and the rear of the information processing apparatus.

The above and other objects, features and advantages of the present invention will become apparent from the following description and the appended claims, taken in conjunction with the accompanying drawings in which like parts or elements denoted by like reference symbols.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view showing a portable personal computer to which the present invention is applied when a display section is pivotally opened with respect to a body;

FIG. 2 is a plan view of the portable personal computer shown in FIG. 1;

FIG. 3 is a left-hand side elevational view of the portable personal computer of FIG. 1 when the display section is closed with respect to the body;

FIG. 4 is a right-hand side elevational view of the portable personal computer of FIG. 1 but when the display section is pivotally opened by 180 degrees with respect

FIGS. 11A to 11C, respectively;

FIG. 12 is a schematic sectional view showing a microphone incorporated in the portable personal computer of FIG. 1;

FIGS. 13A to 13C are partial schematic views and a schematic plan view illustrating pivotal movements of the image pickup section of FIG. 10 when the display section is pivotally closed with respect to the body;

FIGS. 14A to 14C are partial schematic plan views and a schematic plan view illustrating pivotal movements of the image pickup section of FIG. 10 when the display section is pivotally opened with respect to the body;

FIG. 15 is a perspective view of a related art portable personal computer when a display section is pivotally opened with respect to a body;

FIG. 16 is a partial schematic view of a CCD video camera incorporated in the portable personal computer shown in FIG. 15; and

FIG. 17 is a perspective view of another conventional portable personal computer when a display section is pivotally opened with respect to a body.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Before a preferred embodiment of the present

invention is described, in order to make clear a corresponding relationship between various features recited in the claims and elements of the embodiment of the present invention described below, the features of the present invention are described below together with the corresponding elements to which reference symbols denoting them are added in parentheses following them. However, this description provides a mere example and does not signify that the features of the present invention be limited to the recited elements.

An information processing apparatus according to claim 1 comprises a body (for example, a body 2 of FIG. 1) having a keyboard (for example, a keyboard 4 of FIG. 1) thereon, and a display section (for example, a display section 3 of FIG. 1) mounted for pivotal opening and closing movement with respect to the body and having, on a first face thereof which opposes the keyboard when the display section is pivotally closed on the body, a display face for displaying an image thereon, the display section including image pickup means (for example, a CCD video camera 23 of FIG. 1) for picking up an image, accommodation means (for example, casings 112, 118 of FIG. 9) of a substantially tubular shape for accommodating the image pickup means therein, and supporting means (for

example, shafts 112A and 121 of FIG. 9) for supporting the accommodation means at portions thereof in the proximity of the opposite ends of the tubular shape for turning motion in a vertical plane over an angular range of approximately 180 degrees outwardly between a first position at which the image pickup means is directed in the same direction as the first face of the display section and a second position at which the image pickup means is directed in the same direction as a second face of the display section which is opposite to the first face, the body including providing means (for example, a recess 141 of FIG. 9) for providing a space for allowing the accommodation means to be turned without contacting with the body when the display section is pivotally closed on the body.

In the following, an information processing apparatus according to a preferred embodiment of the present invention is described in detail.

Referring first to FIGS. 1 to 6, there is shown a portable personal computer to which the present invention is applied. The personal computer shown generally denoted at 1 is a personal computer of the mini notebook type and includes, as basic components thereof, a body 2 and a display section 3 mounted for pivotal opening and closing

movement with respect to the body 2 along an axis extending along a direction of the rear side of the body 2. In FIG. 2, the display section 3 is opened with respect to the body 2; FIG. 3 is a left-hand side view illustrating the personal computer 1 with the display section 3 closed with respect to the body 2; FIG. 4 is a right-hand side view illustrating the personal computer 1 with the display section 3 opened by 180 degrees with respect to the body 2; FIG. 5 is a front elevational view of the personal computer 1 shown in FIG. 3 and FIG. 6 is a bottom plan view of the personal computer 1 shown in FIG. 4.

A keyboard 4 and a track point (trademark) 5 are mounted on an upper face of the body 2. The keyboard 4 is operated to input various characters, symbols and so forth, and the track point 5 is operated to move a mouse cursor and so forth. Also a speaker 8 which outputs sound and a shutter button 10 are provided on the upper face of the body 2. The shutter button 10 is operated to pick up an image of an object by means of a CCD video camera 23 which is provided on the display section 3.

A claw 13 is provided at an upper end of the display section 3 in FIG. 1, and a hole 6 into which the claw 13 is to be fitted is provided open at a position of

the body 2 which opposes the claw 13 when the display section 3 is closed with respect to the body 2 as seen in FIG. 3. A slide lever 7 is mounted on a front face of the body 2 for sliding movement in parallel to the front face of the body 2 to and from a position in which it engages with the claw 13 fitted in the hole 6 to lock the claw 13 and hence lock the display section 3 to its closed position. When the claw 13 is unlocked from the slide lever 7, the display section 3 can be pivoted with respect to the body 2. A microphone 24 is mounted adjacent the claw 13. The microphone 24 can collect sound also from the back of the personal computer 1 as seen from FIG. 6.

Also a programmable power key (PPK) 9 is provided in the front face of the body 2. An exhaust hole 11 is formed on a right-hand side wall of the body 2, and an intake hole 14 is formed at a lower portion of the front face of the body 2 as seen in FIG. 5. Further, a slot 12 for receiving a PCMCIA (Personal Computer Memory Card International Association) card (PC card) is formed on the right side of the exhaust hole 11.

An LCD (Liquid Crystal Display) 21 for displaying an image thereon is provided on the front face of the display section 3, and an image pickup section 22 is

mounted at an upper end of the LCD 21 in FIG. 1 for pivotal motion with respect to the display section 3. In particular, the image pickup section 22 is mounted for turning to any position within a range of 180 degrees from the direction of the LCD 21 to the opposite direction. The CCD video camera 23 is mounted on the image pickup section 22.

A power supply lamp PL, a battery lamp BL, a message lamp ML and other necessary lamps which may be formed from light emitting diodes (LEDs) are provided at lower portions of the display section 3 in FIG. 1 adjacent the body 2. It is to be noted that reference numeral 40 shown in FIG. 3 denotes a power supply switch provided on the left side face of the body 2, and 25 shown in FIG. 5 denotes an adjustment ring for adjusting the focus of the CCD video camera 23. Further, reference numeral 26 shown in FIG. 6 denotes a lid which covers over an opening through which an add-on memory is to be loaded into the body 2, and reference numeral 41 denotes a small hole into which a pin for disengaging the locking pawl of the lid 26 is to be inserted.

FIG. 7 shows an internal structure of the personal computer 1. Referring to FIG. 7, a CPU (Central Processing Unit) 52, a PC card 53 which is loaded into

the personal computer 1 when necessary, a RAM (Random Access Memory) 54 and a graphics chip 81 are connected to an internal bus (PCI (Peripheral Component Interconnect)) 51. The internal bus 51 is connected to an external (ISA (Industrial Standard Architecture) bus 55, and a hard disk drive (HDD) 56, an I/O (input/output) controller 57, a keyboard controller 58, a track point controller 59, a sound chip 60, an LCD controller 83, a modem 50 and other required devices are connected to the external bus 55.

The CPU 52 serves as a controller for controlling various functions. The PC card 53 is suitably loaded in order to add an optional function to the personal computer 1.

The RAM 54 has, at a point of time when start-up is completed, an electronic mail program (application program) 54A, an auto pilot program (application program) 54B and an OS (operating system) 54C stored therein. The programs mentioned are transferred from the HDD 56 to the RAM 54.

The electronic mail program 54A is a program for sending or transferring an electronic message over a network such as a communication line like a telephone line. The electronic mail program 54A has an in-coming mail capturing function as a particular function. The in-

coming mail capturing function checks a mail box 93A of a mail server 93 for a mail addressed to that user and if such a mail is found, captures the same.

The auto pilot program 54B is a program for successively starting a plurality of processes (or programs) set in advance in a predetermined order.

The OS (basic program software) 54C controls basic operation of the computer represented by the Windows95 (trademark).

Meanwhile, the hard disk drive (HDD) 56 of the external bus 55 side has an electronic mail program 56A, an auto pilot program 56B and an OS (basic program software) 56C stored therein. The OS 56C, auto pilot program 56B and electronic mail program 56A in the hard disk drive 56 are successively transferred to and stored into the RAM 54 in a procedure of start-up (boot-up) processing.

The I/O controller 57 includes a microcontroller 61 provided with an I/O interface 62. The microcontroller 61 includes, in addition to the I/O interface 62, a CPU 63, a RAM 64 and a ROM 69 which are connected to each other. The RAM 64 includes a key-input status register 65, an LED (light emitting diode) control register 66, a setting time register 67, and a register 68. The setting time

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register 67 is used to start operation of a start-up sequence control section 76 when a time (start-up condition) set in advance by the user comes. The register 68 stores a correspondence between a combination (start-up condition) of operation keys set in advance and an application program to be started up. When the stored combination of operation keys is inputted by the user, then the stored application program (for example, an electronic mail) is started up.

The key-input status register 65 stores an operation key flag when the programmable power key (PPK) 9 for single-touch operation is depressed. The LED control register 66 controls the turn-on/off of the message lamp ML which indicates a start-up condition of an application program (electronic mail program) stored in the register 68. The setting time register 67 accepts setting of an arbitrary time.

A backup battery 74 is connected to the microcontroller 61 so that stored values of the key-input status register 65, LED control register 66 and setting time register 67 may be maintained when the power supply to the body 2 is off.

The ROM 69 in the microcontroller 61 has a wakeup program 70, a key-input monitor program 71 and an LED

control program 72 stored in advance therein. The ROM 69 is formed from, for example, an EEPROM (electrically erasable and programmable read only memory). The EEPROM is also called flash memory. Further, an RTC (Real-Time Clock) 75 which normally counts the present time is connected to the microcontroller 61.

The wakeup program 70 in the ROM 69 is a program to check based on the present time data supplied thereto from the RTC 75 whether or not a time set in advance in the setting time register 67 comes and starts up a predetermined process (or program) or the like when the set time comes. The key-input monitor program 71 is a program for normally supervising whether or not the programmable power key (PPK) 9 is depressed by a user. The LED control program 72 is a program for controlling the turn-on/off of the message lamp ML.

The ROM 69 has a BIOS (Basic Input/Output System) 73 written therein. The BIOS is a basic input/output system and is a software program for controlling the transfer (input/output) of data between an OS or application software and a peripheral equipment (display unit, keyboard, hard disk drive or the like).

The keyboard controller 58 connected to the external bus 55 controls inputting from the keyboard 4.

switch 86 is switched on when the shutter button 10 is depressed into a full-depression condition. A reversal switch 87 is switched on when the image pickup section 22 is turned by 180 degrees (when the CCD video camera 23 is turned to a direction to pick up an image on the opposite side to the LCD 21).

Now, a structure of the image pickup section 22 is described with reference to FIGS. 8A to 11C. Referring first to FIG. 8A, the image pickup section 22 is mounted at an upper central portion of the display section 3 for turning motion with respect to the display section 3. In particular, the image pickup section 22 is mounted for turning to any position within a range of 180 degrees from a direction same as the direction of the LCD 21 (FIG. 8A) to the opposite direction (in the direction to the back) (FIG. 8B).

A mounting recess 104 is formed by removing the material of the display section 3 at an upper central position into a U-shape.

The image pickup section 22 includes a CCD video camera unit 101 having a substantially cylindrical profile, a lens-barrel section 102 accommodated in the CCD video camera unit 101, and the focus adjustment ring 25 for slidably moving the lens-barrel section 102 in a

direction of an optical axis of a lens 103 mounted therein to adjust the focus position of the lens 103.

A cable 117 and a CCD 114 are accommodated in the CCD video camera unit 101 and connected to a circuit board in the personal computer 1 as seen in FIG. 9B. The CCD 114 picks up an image of light incident thereto through the lens 103 mounted on the lens-barrel section 102. Image data thus picked up are fetched into the personal computer 1 over the cable 117 and are processed by the personal computer 1 in order to execute various applications.

The focus adjustment ring 25 is manually operated by a user to slidably move the lens-barrel section 102 forwardly or backward (in a direction of the optical axis of the lens 103) in order to focus the lens 103 on an object. Further, the focus adjustment ring 25 is exposed to the upper side and the lower side of the CCD video camera unit 101 so that focusing can be performed by operation thereof not only before the CCD video camera unit 101 is turned (FIG. 8A) but also after the CCD video camera unit 101 is turned by 180 degrees (FIG. 8B).

FIG. 9B particularly shows the internal structure of the image pickup section 22 shown in FIG. 9A. The lens-barrel section 102 has serrations 102A formed on an

outer periphery of a front portion thereof, and further has a male screw thread 102B formed on an outer periphery of a rear portion thereof. Further, the lens 103 is attached to the front end of the lens-barrel section 102.

A lens-barrel support 113 is provided to support the lens-barrel section 102, and a female screw thread 113A is formed on a tubular hollow of the lens-barrel support 113. The male screw thread 102B of the lens-barrel section 102 and the female screw thread 113A of the lens-barrel support 113 are held in meshing engagement with each other so that, when the lens-barrel section 102 is turned, it is slidably moved forwardly and backward relative to the lens-barrel support 113 which is secured to a casing 112 by means of a screw. The CCD 114 for forming a picked up image is attached at the back of the interior of the lens-barrel support 113. A flexible board 115 is accommodated in the lens-barrel support 113. A connector 116 is attached to the flexible board 115, and a cable 117 is connected to the connector 116. Image data picked up by the CCD 114 are fetched into the personal computer 1 over the cable 117 accommodated in a hole in a shaft 112A.

The focus adjustment ring 25 has a circular ring structure, and serrations 25A are formed on an inner

circumference of a hollow of the focus adjustment ring 25. The serrations 102A of the lens-barrel section 102 are engaged with the serrations 25A of the focus adjustment ring 25 so as to allow sliding movement of the lens-barrel section 102 in the forward and backward directions. Further, the focus adjustment ring 25 is supported for turning motion in a casing 118 so that it may not move in an axial direction thereof. Accordingly, when a user turns the focus adjustment ring 25, then the turning motion is imparted to the lens-barrel section 102 through the serrations 25A and the serrations 102A to slidably move the lens-barrel section 102 in the forward or backward direction. In other words, the user can focus the lens 103 on an object.

The focus adjustment ring 25, lens-barrel section 102, lens-barrel support 113, flexible board 115, connector 116 and cable 117 are accommodated in the casing 112 and the casing 118 thereby to form the CCD video camera unit 101. A panel 119 is mounted on the casing 118.

The shaft 112A is formed at a right-hand side end portion of the casing 112 and supported for rotation by a bearing 123 secured to the display section 3 by means of a screw. Meanwhile, a shaft 121 is secured to a left-hand

side end portion of the casing 112 by means of a screw. The shaft 121 is supported for rotation by a receiving member 120 secured to the display section 3 by means of a screw. Accordingly, the casing 112 assembled integrally with the casing 118 is mounted for turning motion on the display section 3 around an axis of the shaft 112A and the shaft 121. A cam 122 is connected to the shaft 121 (FIG. 9C) and is operable to switch the reversal switch 87 on or off. It is detected from the state of the reversal switch 87 whether the image pickup section 22 is directed to the front or to the rear.

FIG. 10 particularly shows the image pickup section 22 as viewed in a direction indicated by arrows along line I-I' shown in FIG. 9A. As seen from FIG. 10, the shaft 112A (shaft 121) is formed (placed) at a position displaced a little upwardly and rearward from the center of a substantially cylindrical member formed from the casing 112 and the casing 118. Thus, the substantially cylindrical member is formed such that the casing 118 has the maximum dimension 1a from the shaft 112A and the casing 112 has the minimum dimension 1b. Consequently, the image pickup section 22 can pivot in an outward direction (in the clockwise direction in FIG. 10), but cannot pivot in an inward direction (in the

counterclockwise direction in FIG. 10).

FIG. 11A shows the personal computer 1 where the image pickup direction of the image pickup section 22 is set to the same direction as the LCD 21, and FIG. 11D shows the image pickup section 22 as viewed in a direction indicated by arrows along line I-I' of FIG. 11A in an enlarged scale. FIG. 11B shows the personal computer 1 where the image pickup direction of the image pickup section 22 is turned by 90 degrees in the clockwise direction with respect to the LCD 21, and FIG. 11E shows in an enlarged scale the image pickup section 22 of FIG. 11B as viewed in the direction indicated by the arrows along line I-I' of FIG. 11A. FIG. 11C shows the personal computer 1 where the image pickup section 22 is turned by 180 degrees in the clockwise direction with respect to the LCD 21, and FIG. 11F shows in an enlarged scale the image pickup section 22 of FIG. 11C as viewed in the direction indicated by the arrows along line I-I' of FIG. 11A.

A recess 141 is formed such that, even if the display section 3 is pivotally closed with respect to the body 2 while the lens-barrel section 102 remains projecting most from the casing 118, the image pickup section 22 can be turned without interfering with the

when it is directed in different image pickup directions as viewed from the front side of the display section 3. In particular, FIG. 14A shows the image pickup section 22 when it is directed in the opposite direction to the LCD 21. FIG. 14B shows the image pickup section 22 when it is in a position turned by 90 degrees from the direction of the LCD 21. FIG. 14C shows the image pickup section 22 when it is directed in the same direction as the LCD 21.

A method of using the personal computer 1 having the construction described above is described below. First, the display section 3 will be pivotally opened with respect to the body 2 until it extends substantially upwardly from the body 2 so that the user can see the LCD 21. In order to fetch an image of an object not shown into the personal computer 1, the user turns the CCD video camera unit 101 to an image pickup direction toward the object and stop it at a suitable position. Since the image pickup direction of the CCD video camera unit 101 can be set to any position within the range of 180 degrees from the direction same as that of the LCD 21 to the opposite direction (direction of the back of the LCD 21), the CCD video camera unit 101 can pick up not only an image of an object in front of the LCD 21, that is, the user of the personal computer 1, but also an image of

an object around the same. After the CCD video camera unit 101 is set to the image pickup direction, the user turns the adjustment ring 25 to adjust the position of the lens-barrel section 102 so that the CCD video camera unit 101 may be focused on the object.

If the CCD video camera unit 101 is focused successfully on the object, then the user depress the shutter button 10 to pick up an image of the object with the CCD video camera 23. Image data thus obtained are stored into the hard disk drive (HDD) 56. The CCD video camera 23 supplies the image data of the object to the processing block 82. The processing block 82 processes the image data and then supplies them to the graphics chip 81. The graphics chip 81 stores the video data inputted thereto into the built-in VRAM 81A, and thereafter reads out and outputs them suitably to the LCD controller 83. The LCD controller 83 outputs the image data supplied thereto from the graphics chip 81 to the LCD 21 so as to be displayed on the LCD 21. Further, the image data captured by the CCD video camera may be printed by a printer not shown if necessary.

Further, the personal computer 1 may be connected to the communication network 92 through the modem 50, public telephone line 90 and Internet service provider 91

so that the image may be transmitted to a personal computer of the other party of communication. On the reception side, the image can be displayed on the real time basis based on the received image data. Therefore, the personal computer 1 can be utilized for a television conference system or a like system.

While a preferred embodiment of the present invention has been described using specific terms, such description is for illustrative purposes only, and it is to be understood that changes and variations may be made without departing from the spirit or scope of the following claims.